

*Application for*  
**UNITED STATES LETTERS PATENT**

*Of*  
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**CONTAINER CAPABLE OF KEEPING A LENGTHWISE CONTRACTED STATE AND  
CONTRACTION METHOD THEREOF**

CONTAINER CAPABLE OF KEEPING A LENGTHWISE CONTRACTED STATE  
AND CONTRACTION METHOD THEREOF

BACKGROUND OF THE INVENTION

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Field of the Invention

The present invention relates to a container for juice or mineral water formed by a blow molding method or the like, which is referred to as stretch blow molding, injection blow molding, or generally PET blow molding, and more particularly to a container whose lengthwise size can be reduced (capacity can be reduced) after the content is drunk up and the contraction method thereof.

0002

Description of the Related Art

Production of synthetic resin bottles has been considerably increasing in recent years. However, after juice or mineral water in a container body is drunk up, the container body is discarded with a shape thereof remaining as before drinking up. When the container body is discarded in a trash can, the trash can is soon filled as if air were discarded therein, and finally the container body is left on a road, deteriorating life environments. In addition, costs for collecting drained container bodies and labor costs for cleaning place a heavy burden on public works.

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Although this kind of synthetic resin bottle can be manufactured by simple means such as blow molding, it cannot sufficiently resist strong vibrations of automobiles or other transportation means or stacking for display at a store.

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Furthermore, while the container is transported from a container manufacturer to a bottler of juice or mineral water, the container body is bulky as if air were transported, requiring considerably high costs for transporting the product.

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Thus, the inventor of the application has suggested a liquid container that can be easily contracted when drained and collected. The liquid container is made of relatively soft synthetic resin, and a body thereof has a bellows peripheral wall with a top tap (Japanese Patent Laid-Open No. 2001-213418, Abstract).

0006

In addition, the inventor has suggested applying a load on a container body in a perpendicular direction and/or a twisting direction to cause contraction of the capacity, means for keeping the contracted shape, and the container body (Japanese Patent Laid-Open No. 2002-68156, Abstract). However, both of the above suggestions cannot achieve a reduced height and sufficient contraction of the container to keep the contracted state when the container body is collapsed.

0008

#### SUMMARY OF THE INVENTION

Generally, an object of the invention is to extremely reduce the capacity of a container body when juice or mineral water in the container body is drunk up and the container body is discarded, and to increase the number of empty container bodies received by a trash can, compared to the related art. This allows transportation of the empty container bodies in large number at the same time. Thus, another object of the invention is to extremely reduce collection costs and labor costs for cleaning and collection.

0009

A further object of the invention is to extremely increase the number of transported containers per transportation, compared to the related art, when the container is transported from a container manufacturer to a bottler of juice or mineral water.

0010

The object of the present invention is, as described above, to extremely reduce the capacity of the container body when the drained container body is discarded or transported. A contracted shape of the container body is kept for a long time, or for a long term, or until crushing, fusion or other operations for recycling, without any restoring force applied to the container body.

0011

The overall shape of the container body according to the invention is selected from columns including elliptical ones, prisms including rectangular ones, and cones and pyramids including truncated ones, and the horizontal cross sectional shape of the container body is selected from circles including ellipses, and squares including rectangles.

0012

A further object of the invention is to increase an area on the container body to which a label with an explanation of the content of the container or a trademark printed is affixed, or on which an explanation or a trademark is directly printed, compared to the related art.

0013

When used as a beverage container, the container body according to the invention has a good appearance to attract much interest of a user, and can be prevented from slipping and falling in use, or the content can be prevented from overflowing. For this purpose, there are provided a container capable of keeping a lengthwise contracted state and a contraction method thereof.

0014

A feature of the invention is that a container body includes: a top tap; a small width in a height direction at a bottom; and a horizontal bellows formed on the whole or part in a longitudinal direction of the container body, except the top tap, and the width in the height direction.

0015

When the bellows of the container is pressed longitudinally from both sides thereof toward a center, the bellows is collapsed to overlap, a connection between the top tap and the container body is bent to place the tap in the overlapping bellows, and this state is kept.

0016

Another feature of the invention is that a container body includes: a top tap; a small width in a height direction at a bottom; a flat portion in a middle portion; and a horizontal bellows formed on the whole or part in a longitudinal direction of the container body, except the tap, the width in the height direction, and the flat portion.

0017

When the bellows of the container is pressed longitudinally from both sides thereof toward a center, the bellows is collapsed to overlap, a connection between the top tap and the container body is bent to place the tap in the overlapping bellows and/or the flat portion, and the width in the height direction at the bottom of the container body is placed in the bent and overlapping bellows and/or the flat portion, and this state is kept.

0018

The technical scope of the invention includes a further feature that the bellows of the container body has one diameter smaller than the other, with a diameter gradually increasing toward the other end to be a diameter equal to that in a lower

portion, and includes a contraction method of a container capable of keeping a lengthwise contracted state, wherein a force is perpendicularly applied to the bellows of the container body, and a force is applied that presses, in one direction, an inner periphery of a piece of fold and/or part of folds that constitute the bellows, causing a force in an opposite direction to be applied to an outer periphery to keep a lengthwise contracted bellows.

0019

The technical scope of the invention includes further features that the overall shape of the container body is selected from columns including elliptical ones, prisms including rectangular ones, cones and pyramids including truncated ones, hourglass dram shaped, and barrels; the horizontal cross sectional shape of the container body is selected from circles including ellipses, and squares including rectangles; and a label with an explanation of the content of the container or a trademark printed is affixed to the outer periphery of the container body.

0020

The technical scope of the invention includes a container body including: a tap protruding upward from a center of a top; and horizontal bellows formed on inner and outer walls of the whole or part in a length (height) direction of the container body, except the tap, wherein the bellows has an upper diameter smaller than a lower diameter with a diameter gradually increasing toward a lower portion; when a force is

perpendicularly applied to the bellows of the container body, the force acts downwards in an inner diameter direction and upwards in an outer diameter direction of upper folds of the bellows, and the force acts upwards in an inner diameter direction and upwards and downwards in an outer diameter direction of lower folds of the bellows to keep a lengthwise (height) contracted bellows of the container body; and when the container body is carried or held after part of, for example, juice is drunk, the container body can be contracted depending on the amount of drunk juice, and the capacity of the container body to be carried or stored can be reduced by the amount.

0021

The invention has other outstanding objects, features, and advantages, and they will become apparent from the following descriptions of the embodiments.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of an entire container body according to an embodiment of the invention;

FIG. 2 is a bottom view of the entire container body according to the embodiment of the invention;

FIG. 3 is a front view of a state where the container body is drained and to be collapsed;

FIG. 4 is a front view of a state where the container body is being collapsed;

FIG. 5 is a sectional view of a final stage of collapse of the container body;



FIG. 6 is a sectional view of a state where the container body has been collapsed;

FIG. 7 is a sectional view of an example where the container body is collapsed by a foot;

FIG. 8 is a front view of an entire container body according to another embodiment of the invention;

FIG. 9 is a front view of a state where the container body according to another embodiment of the invention is being collapsed;

FIG. 10 is a sectional view of a final stage of collapse of the container body according to another embodiment of the invention;

FIG. 11 is a sectional view, partially broken away, of the collapsed container body;

FIG. 12 is a sectional view of the entire collapsed container body;

FIG. 13 is an enlarged sectional view of folds that constitute the container body;

FIG. 14 shows a deformed state of a shoulder when the container body is collapsed, and an early stage of pressing;

FIG. 15 shows a deformed state of a shoulder when the container body is collapsed, and a middle stage of pressing;

FIG. 16 shows a deformed state of a shoulder when the container body is collapsed, and a completion stage of pressing;

FIG. 17 shows a deformed state of a middle barrel when the container body is collapsed, and an early stage of pressing;

FIG. 18 shows a deformed state of a middle barrel when the container body is collapsed, and a middle stage of pressing;

FIG. 19 shows a deformed state of a middle barrel when the container body is collapsed, and a completion stage of pressing;

FIG. 20 shows an example where the container body is in a truncated cone shape;

FIG. 21 is a front view of the container body, and shows an example where a surface for a label is provided;

FIG. 22 is a front view of the container body, and shows another example where a surface for a label is provided; and

FIG. 23 is a front view of the container body, and shows a further example where a surface for a label is provided.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, embodiments of the invention will be described with reference to the drawings.

0023

In FIG. 1, reference numeral 1 denotes a container body, and a bellows 2 is formed on outer and inner peripheries in a height (length) direction of the container body.

0024

(Embodiment 1)

FIGS. 3 and 6 show a state where, for example, mineral water in the container body 1 is drunk up, and then the container body 1 is collapsed from one side or both sides in the height

(length) direction. Specifically, the container body 1 is collapsed and the collapsed state is kept, thus the invention has an excellent configuration and produces excellent effects.

0025

As an example of the configuration of the container, as seen from FIG. 11, reference numeral 3 denotes a tap of the container body 1, with a thread on a periphery thereof, having an about 28 mm diameter and a 23 mm height. Immediately below the tap 3, a trumpet-shaped connection D having an enlarged lower diameter of about 51 mm and a 5 to 10 mm height is connected to an axis of the tap 3. In a shoulder C of the container body 1, a U-shaped annular groove E with a horizontal inner end is provided, and an end of the trumpet-shaped connection D and an inner side of the annular groove E are connected. An outer side of the U-shaped groove E is in a dome shape 4 toward a lower portion, and an outer diameter d1 of a first fold 5, that is, an outer diameter d1 of an uppermost fold of the bellows 2 has a smaller diameter than an outer diameter d of the container body 1. An outer diameter d2 of a second fold 6 is larger than the outer diameter d1 of the first fold 5, and smaller than the outer diameter d of the container body 1.

0026

An outer diameter d3 of a third fold 7 is larger than the outer diameter d2 of the second fold 6, and smaller than the outer diameter d of the container body 1, and connects to the second fold 6 to form a staircase shape as viewed from

the side. In the shown embodiment, three steps are provided, but of course, the number of steps is not limited to three, and any plurality of steps may be provided.

0027

The container body 1 in FIG. 1 has a 195 mm height, a 71.5 mm maximum diameter, and a 500 ml capacity, and has a wall with 12 steps.

0028

The outer diameter  $d_1$  of the first fold 5 is 30.25 mm, the outer diameter  $d_2$  of the second fold 6 is 33.95 mm, and an inner diameter between the first fold 5 and the second fold 6 is 47 mm.

0029

The outer diameter  $d_3$  of the third fold 7 is 34.85 mm, and an inner diameter between the second fold 6 and the third fold 7 is 51.1 mm. An outer diameter  $d$  of a fourth fold 8, which is the maximum outer diameter of the container body 1, is 35.75 mm, and an inner diameter between the third fold 7 and the fourth fold 8 is 54.5 mm. Each of fifth to twelfth folds has the same diameter as the outer diameter  $d$  of the fourth fold 8, and an inner diameter between each of them is the same as that between the third fold 7 and the fourth fold 8.

0030

In this case, each fold has a shape like an unidentified flying object (UFO) called an Adamski shape, and is horizontally divided into an upper side and a lower side. In

the drawing, the heights of the upper side (h1) and the lower side (h2) of the first fold are 6.5 mm and 5.5 mm, those of the second fold are 7 mm and 5 mm, and those of the third fold are 8.5 mm and 6.5 mm.

0031

FIG. 13 shows a sectional shape of the fold in detail. Specifically, as examples of dimensions of the first fold 5 to the third fold 7, an upper surface 20 of a wide double cone shape forms a curve 9 of 20 mmR in this embodiment where the upper surface protrudes outwards, while a lower surface 21 forms a line 11 via a protruding arc 10 of 0.8 mmR, which is significant.

0032

The configuration of the embodiment together with the effects will be now described. The container body 1 in FIG. 1 is divided into a barrel A including a middle portion and a lower portion, and an upper shoulder C, and each of the barrel A and the shoulder C has two, large and small diameters to keep a stable vertical state.

0033

Specifically, the folds having the same inner and outer diameters are formed on the barrel A including the middle portion and the lower portion, the shoulder C is curved to form a gentle protrusion toward the tap 3, and in the shoulder C, an inner diameter of a trough 18 that forms the fold is gradually reduced from the middle portion toward the tap 3, and the inclination of the trough 18 is larger than that in

the barrel A. Thus, in a state where the middle portion is extended, the inner diameter and a slope of a crest 17 and the trough 18 that form the fold can be kept in an extended state by material's own strength and elasticity. A bottom B is recessed with a sharp slope to naturally improve stability.

0034

When a cap 14 of the container body 1 is detached, the content is drunk up, the container body 1 is vertically placed between palms of both hands G, H as shown in FIG. 3, and the container body 1 is pressed by the hands G, H toward the center of the container body 1, the container body 1 is collapsed as shown in FIG. 4.

0035

This requires a strong force for pressing, and in many cases, index fingers to little fingers of both hands are placed along the bottom B of the container body 1, thumbs of the both hands G, H are placed on the tap 3, and the fingers are pressed toward the center of the container body 1, thus the tap 3 is embedded in the container body 1 as shown in FIG. 5.

0036

In this state, the shoulder C and the barrel A including the upper end lower portion of the container body 1 are compressed and contracted as shown in FIGS. 11 to 16. Specifically, the folds in the shoulder C are pressed from a state in FIG. 14, an end surface of the trough 18 compresses an end surface of a trough of an adjacent fold. At this time, as viewed from a top of the crest 17 of the fold, the troughs

18 on both sides are urged toward the top of the crest 17 as shown in FIGS. 15, 16. A component of compression force on the gentle slope of the upper surface 20 of the fold is larger than that on the sharp slope of the lower surface 21, thus the trough 18 on the sharp slope side moves toward the top of the crest 17.

0037

At this time, two major changes occur on the container body 1. One is that the inner diameter of the crest 17 that constitutes the fold increases by an expansion pressure, or the inner diameter of the trough 18 is reduced by a compression pressure, and the other is that the sharp slope of the lower surface 21 that constitutes the fold is bent.

0038

Then, the sharp slope passes immediately below the crest 17, and as shown in FIG. 16 is placed inside the gentle slope of the upper surface 20 to reduce the height of the container body 1 to a contracted state, then restoring forces of the inner diameter of the crest 17 and the inner diameter of the trough 18 act, and the lower surface 21, which has been bent by the above described operation, is returned to the extended state to be stable. Thus, the contracted state can be kept without a compression force being always applied.

0039

The trough 18 with the small diameter receives the compression pressure to further reduce the inner diameter and cause pressure stress. When the compression pressure is not

applied, the stress is released to return to the extended state. When the cap 14 is screwed in a pressurized state to be subjected to atmospheric pressure, the container body 1 keeps the contracted state. When no compression stress is caused because of a difference between the inner diameters of the troughs 18, the contracted state is kept.

0040

As a result, repeated tests reveal that the height (capacity) of the container body 1 is reduced by a factor of 3 to 4, and space for the container body 1 in a trash can or the like can be extremely reduced.

0041

In the invention, the tap 3 is further pressed toward the bottom B of the container body 1 after the above described state is obtained. At this time, the folds tightly contact each other and overlap in the barrel A and the shoulder C of the container body 1, and thus further pushing up the bottom B causes no downward movement. Thus, the tap 3 is further pressed downwards, then an end of the trumpet-shaped connection D first presses downwards an inside of the U-shaped groove E. This causes an outer upper end of the groove E to be connected and fastened to the shoulder C. Thus, the end of the trumpet-shaped connection D is pressed downwards to move in an enlarging direction with the U shape collapsed and the inside pressed downwards, and finally pressed into the container body 1 together with the tap 3 as shown in FIG. 4.



0042

In this embodiment, the connection D between the tap 3 and the container body 1 is in the trumpet shape, and when collapsed, the connection is reversed and fitted into the container body 1.

0043

The height (capacity) of the container body 1 can be sufficiently reduced without forcing the tap 3 into the collapsed container body 1. With reference to FIG. 1, the fold of the container body 1 has the shape like the wide Adamski type UFO, and is thus horizontally divided into the upper side and the lower side. In FIG. 1, the heights of the upper side (h1) and the lower side (h2) of the first fold are 6.5 mm and 5.5 mm, those of the second fold are 7 mm and 5 mm, and those of the third fold are 8.5 mm and 6.5 m.

0044

The fourth fold 8 to the twelfth fold 12 have the same dimension and the same heights of the upper side (hx) and the lower side (hy).

0045

In the drawing, reference numeral 20 denotes the upper surface including an inner surface of the wide Adamski type UFO shape, and reference numeral 21 denotes the lower surface including the inner surface of the wide Adamski type UFO shape. The upper surface 20 forms the curve 9 of 20 mmR in this embodiment where the upper surface 20 protrudes outwards, while

the lower surface 21 forms the line 11 via the protruding arc 10 of 0.8 mmR, which is significant.

0046

The trough 18 with the small inner diameter receives the compression pressure to cause pressure stress. When the compression pressure is not applied, the stress is released to return to the extended state. When the cap 14 is screwed in the pressurized state to be subjected to atmospheric pressure, the container body 1 keeps the contracted state. When no compression stress is caused by the difference between the inner diameters of the troughs 18, the contracted state is kept.

0047

In this embodiment, the diameter of the fold in the shoulder C of the container body 1 increases toward the lower portion as described above, and thus the collapsed folds overlap in a slope shape where the outer periphery is higher than the inner periphery.

0048

Then, the dome shape 4 on the upper surface of the tap 3 and/or the shoulder is pressed, a pressing down force ( $F_1$ ) acts on the outer periphery of each fold as shown in FIG. 11. As a result, as shown in FIG. 11, the folds of the barrel A including the middle portion and the lower portion overlap in a slope shape opposite in direction to that in the shoulder C, where the outer periphery is lower than the inner periphery.

0049

In the collapsed container body 1, the dome shape 4 and the curve 9 that form the upper slope of the fold in the shoulder C and the lower slope of the fold in the barrel A are balanced to keep the collapsed state without placing the cap 14 back on the container body 1.

0050

As a result, repeated tests reveal that the height (capacity) of the container body 1 is reduced by a factor of 3 to 4, and space for the container body 1 in a trash can or the like can be extremely reduced.

0051

As described above, in the embodiment of the invention, the tap 3 is pressed and embedded in the container body 1, and at the same time, the bottom B and its surroundings of the container body 1 is embedded in the container body 1 by an effect corresponding to reversing the shoulder C of the container body 1, thus the height (capacity) of the container body 1 can be reduced by a factor of about 5, compared to the empty container body 1 to be discarded without being collapsed.

0052

Commercially available beverage is generally contained in a 500 ml container, and the beverage is rarely drunk up at a time. Thus, a container has to be carried that contains remaining beverage and an empty portion with the capacity unchanged. Contrary to this, the container according to the

invention can be carried with an empty portion after drained being compressed, and be accommodated in a handbag.

0053

Relatively weak children or women can easily collapse the container body 1 by stepping thereon as shown in FIG. 7, besides pressing by hands.

0054

PET bottles often used as beverage containers include a flat portion for a label J that indicates a trademark, an explanation of the content, or a source on a middle portion of the container body 1, which is shown in FIGS. 8 to 10.

0055

The empty container body 1 after the content is drunk up is collapsed similarly as described above, and detailed descriptions thereof will be omitted. The portion for a label J is provided on the middle portion of the container body 1 and has an inner diameter substantially equal to the outer diameter of the bellows 2 of the container body 1, and when the container body 1 is collapsed from upward and downward, the tap 3, and the bottom B and its surroundings are pressed into the portion for a label J to keep a collapsed state with good appearance and without losing its shape. Thus, the number of container body 1 received by the trash can extremely increase, and the discarded container body 1 has good appearance.

0056

(Other embodiments)

In the above described embodiment, the container body 1 is cylindrical or in the shape similar thereto. However, a container body 1 in an hourglass dram shape in a vertical direction is easy to grip, and a container body 1 in a truncated cone shape K or a truncated pyramid shape is stable as shown in FIG. 20, and any appropriate shape can be selected.

0057

In the container body 1, the portion for a label J may be provided on the lower portion of the container body 1 as shown in FIG. 21, on the upper portion as shown in FIG. 22, or on both portions as in FIG. 23.

0058

In the embodiment, the bellows 2 formed on the container body 1 is in the shape of vertically continuous, horizontal annular folds.

0059

However, it is revealed that folds in a continuous spiral shape can be more easily collapsed by a twisting force applied in addition to the vertical pressing force toward the upper portion or the middle portion of the container body 1. The spiral may be formed of several streaks rather than a single streak.

0060

The main advantage of the invention described above is to extremely reduce the capacity of the container body when the container is discarded, and to increase the number of container bodies received by the trash can or the like.

0061

The contracted container bodies can be transported in large number at the same time to extremely reduce collection costs and labor costs for cleaning and collection.

0062

The container body according to the invention has a good appearance to attract much interest of a user, and the bellows of the container body serves as a friction stop to prevent the container body from slipping and falling in use, or prevent the content from overflowing.

0063

Even the container body collapsed according to the invention has a good design, and thus can be used as an outer container as it is.

[Description of Characters]

- A barrel
- B bottom surface of container body 1
- C shoulder of container body 1
- D trumpet-shaped connection
- E annular groove
- F1 pressing down force
- G hand
- H hand
- J surface for label
- K truncated cone shape
- d outer diameter of container body 1

d1	outer diameter of first fold	5
d2	outer diameter of second fold	6
d2	outer diameter of third fold	7
h1	upper side of first fold	
h2	lower side of first fold	
hx	upper side of fold	
hy	lower side of fold	
1	container body	
2	bellows	
3	tap	
4	dome shape	
5	first fold	
6	second fold	
7	third fold	
8	fourth fold	
9	curve of 20 mmR	
10	protruding arc of 0.8 mmR	
11	line	
14	cap	
17	crest	
18	trough	
20	upper surface	
21	lower surface	